

ClimaDry II Modulating Reheat Option Submittal Data

English Language/I-P Units



Created: 9 Oct., 2009B



SUBMITTAL DATA

Unit Designation: _____

Job Name: _____

Architect: _____

Engineer: _____

Contractor: _____

ObsOleto

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LC414

Created.: 9 Oct., 2009B



1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
TL	V	0	9	6	A	H	D	3	A	D	B	T	S	

Heat Exchanger Options

	Non Coated Air Coil		Coated Air Coil	
	Copper	Cupro-Nickel	Copper	Cupro-Nickel
ClimaDry Reheat	E	F	D	P

Created: 17 Sept., 2009B

Notes:

1. ClimaDry II reheat option (Digit 12 - D, E, F or P) must be ordered with original equipment (cannot be field added). Unit must have DXM control. 460 volts require 4 wire power supply with neutral. Not available for units with internal water valve, flow regulator options, or 575Volt. Check unit submittal for limitations and specific requirements.
2. Antifreeze is not required for models listed in Table 1 but may be required due to EWT in heating or other models with original ClimaDry Option on the same loop.
3. ClimaDry II is not recommended for applications with poor water quality (see water quality guidelines in unit IOM). The copper heat exchanger (Digit 12 - D or E) with cast iron pump are designed for closed loop systems.
4. The Cupro-Nickel heat exchanger (Digit 12 - F or P) also includes bronze pump, and is required for use with open loop or ground water systems.
5. Max working water pressure for the ClimaDry II option is 145psig.
6. Available with TLV models (see Table 1). Check unit submittal data nomenclature for models with ClimaDry II reheat option.
7. Thermostat must be either:
 - A. Thermostat with dehumidification mode (ATP32U04 or similar)
 - B. Thermostat and separate humidistat or dehumidistat controller (see Table 2 for DXM DIP settings).
8. ClimaDry II units must have minimum entering air temperature of 70°F DB / 61°F WB while in the dehumidification mode.

Table 1: ClimaDry II Availability

Model	Configuration	Yes	No
TL	Vertical	X	



ClimaDry II Modulating Reheat Option

ClimateMaster's patented ClimaDry II Dehumidification option is an innovative means of providing modulating reheat without the complication of refrigeration controls. ClimaDry II is hot gas generated reheat, which utilizes one of the biggest advantages of a Water-Source Heat Pump (WSHP), the transfer of energy through the water piping system. ClimaDry II simply diverts condenser water through a water-to-air coil that is placed after the evaporator coil. If condenser water is not warm enough, the internal "run-around" loop increases the water temperature with each pass through the condenser coil (see figure 1, below).

ClimaDry II Benefits

ClimaDry II is like no other reheat option on the market. Proportional reheat is controlled to the desired leaving air temperature set point (factory set point of 72°F, 22°C), no matter what the water loop temperature is. Since dehumidification operation will occur under less than full load cooling conditions a good percentage of the time, it is important to have a reheat function that provides 100% reheat in the spring and fall when the water loop is cool. Supply air temperature is field adjustable to +/- 3°F [± 1.7°C] for even greater flexibility with the optional potentiometer. Competitors without ClimaDry II typically use an on/off (non-modulating) refrigeration based reheat circuit, typically referred to as "Hot gas reheat" (HGR). HGR needs higher condensing temperatures to work well,

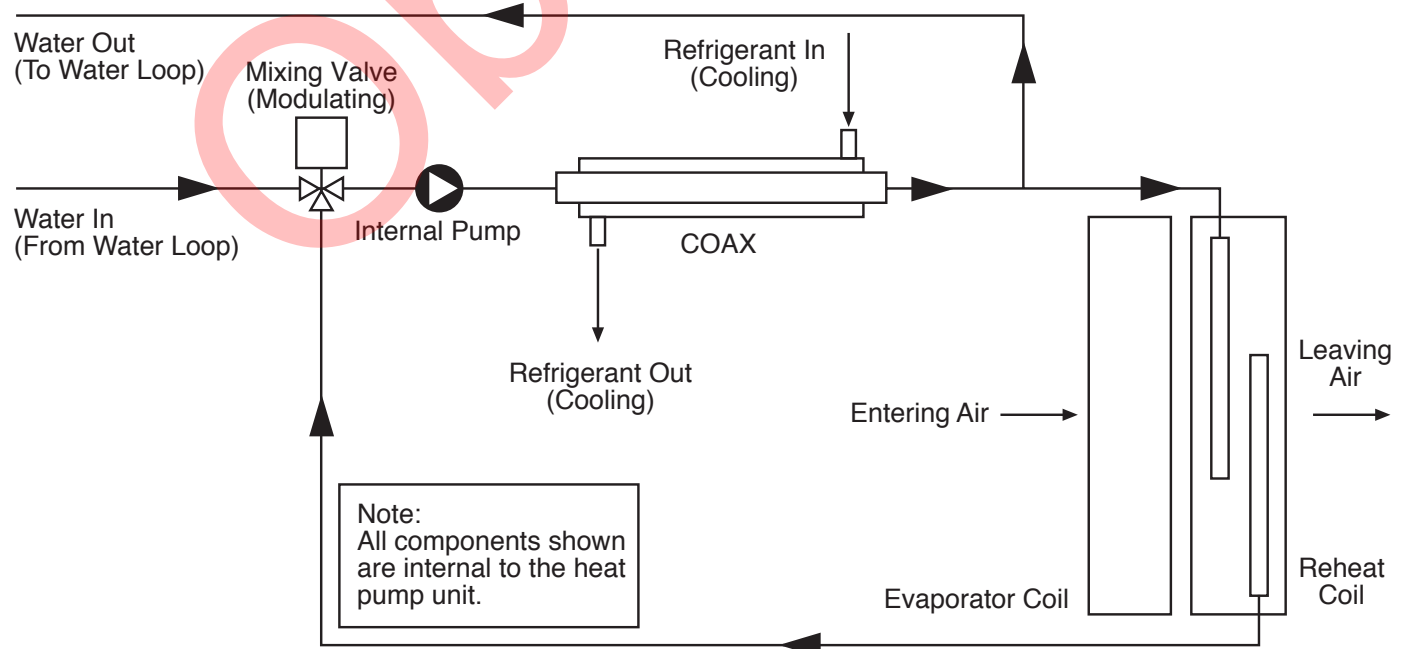
typically 85°F [29°C] entering water temperature (EWT). With HGR, cooler water temperatures produce cooler supply air temperatures, which could overcool the space, requiring additional space heating from another source or a special auto-change-over relay to allow the unit to switch back and forth between reheat and heating. Rarely does HGR provide 100% reheat, like ClimaDry II. ClimaDry II has a simple and easy to troubleshoot refrigerant circuit. No switching valves or hard to diagnose leaky check valves are utilized. No unusual refrigerant pressures occur during the reheat mode. The ClimaDry II refrigerant circuit is like every other ClimateMaster unit (without reheat), so everything the technician already knows applies to troubleshooting the ClimaDry II refrigeration circuit. Plus, the water loop portion of the ClimaDry II option is easy to understand and diagnose.

ClimaDry II Applications

ClimaDry II can be applied to a number of common applications, such as . . .

- Classrooms.
- Condominiums.
- Apartments.
- Computer rooms.
- Spaces with high latent loads like auditoriums, theaters, convention centers, etc.
- Most applications where humidity is a problem. (Note: ClimaDry is not for use in high fraction outdoor air applications or in applications with corrosive atmospheres, such as pool rooms.)

Figure 1: ClimaDry II Schematic



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ClimaDry II Submittal Data Eng/I-P



With the ClimaDry II option, return air from the space is cooled by the air-to-refrigerant (evaporator) coil, and then reheated by the water-to-air (reheat) coil to dehumidify the air, but maintain the same space temperature (thus operating as a dehumidifier).

The moisture removal capability of the heat pump is determined by the unit's latent capacity rating. Latent capacity equals Total capacity minus Sensible capacity. Using unit performance data from submittals (<http://www.climatemaster.com/>) select the correct model, use your maximum entering water temperature (EWT) and flow rate to select TC and SC. For example, at 80°F [26.7°C] EWT and 15 GPM, the moisture removal capability (latent capacity) of a ClimateMaster TLV120 is 30.4 Mbtuh [8.8kW] as shown in figure 2.

Dividing the latent capacity by 1,069 BTU/LB of water vapor at 80°F DB and 67°F WB [26.7°C DB and 19.4°C WB] moist air enthalpy, converts the amount of moisture

removal to pounds per hour (multiply pounds per hour by 0.4536 to obtain kg/hr). Calculations are shown in figure 2.

Most ClimateMaster heat pumps have a sensible-to-total (S/T) ratio of 0.72 to 0.82. Therefore, approximately, 25% of the cooling capacity is dedicated to latent cooling capacity (moisture removal). When selecting a unit with ClimaDry II, the space sensible and latent loads should be calculated. If the unit will be used for space cooling, a unit with at least enough capacity to satisfy the building sensible load should be selected. If the latent cooling load is not satisfied by the selection, a larger unit with enough latent capacity will be required. If the unit will be used for dehumidification purposes only, the latent capacity is the only consideration necessary. In this case, sensible load is immaterial.

Figure 2: Example TLV120 Performance

Performance Data TLV120

$$LC = TC - SC = 115.4 - 85.0 = 30.4 \text{ Mbtuh}$$

$$30,400 \text{ Btuh} \div 1069 = 28.4 \text{ lbs/hr (12.9 kg/hr)}$$

4000 CFM Nominal Airflow Heating & Cooling

WATER/BRINE				Cooling - EAT 80/67°F					Heating - EAT 70°F				
EWT °F	FLOW gpm	PD psi	PD ft.	TC	SC	kW	HR	EER	HC	kW	HE	LAT	COP
80	15.00	1.1	2.4	115.4	85.0	9.0	145.9	12.9	160.5	9.4	128.2	106.6	5.0
	22.50	3.3	7.6	119.6	87.0	8.5	148.5	14.1	169.1	9.6	136.2	108.6	5.1
	30.00	6.4	14.7	121.8	88.1	8.2	149.9	14.8	173.8	9.8	140.5	109.7	5.2
85	15.00	1.1	2.4	111.9	83.5	9.4	143.8	12.0	169.9	9.7	136.8	109.0	5.1
	22.50	3.2	7.4	116.2	85.5	8.9	146.4	13.2	174.6	9.5	142.0	110.6	5.4
	30.00	6.3	14.4	118.3	86.5	8.6	147.7	13.8	177.2	9.5	144.8	111.4	5.5
90	15.00	1.0	2.3	108.5	81.9	9.8	141.7	11.1	179.4	10.0	145.3	111.4	5.3
	22.50	3.2	7.4	112.7	83.9	9.2	144.2	12.2	180.0	9.4	147.8	112.5	5.6
	30.00	6.2	14.3	114.9	84.9	9.0	145.5	12.8	180.5	9.2	149.1	113.1	5.8
100	15.00	0.9	2.2	102.1	79.3	10.7	138.5	9.6	Operation Not Recommended				
	22.50	3.1	7.2	106.1	80.9	10.1	140.5	10.5					
	30.00	6.0	13.9	108.2	81.8	9.8	141.6	11.0					
110	15.00	0.9	2.0	96.1	77.2	11.7	136.1	8.2					
	22.50	3.0	6.9	99.7	78.4	11.1	137.5	9.0					
	30.00	5.8	13.4	101.7	79.1	10.8	138.4	9.5					
120	15.00	0.8	1.9	90.6	76.0	12.9	134.7	7.0					
	22.50	2.9	6.7	93.8	76.6	12.2	135.4	7.7					
	30.00	5.6	13.0	95.5	77.0	11.8	135.9	8.1					

Dividing the latent capacity by 1,069 BTU/LB of water vapor at 80°F DB and 67°F WB [26.7°C DB and 19.4°C WB] moist air enthalpy, converts the amount of moisture removal to pounds per hour (multiply pounds per hour by 0.4536 to obtain kg/hr). Calculations are shown in figure 2.

Note: Minimum entering air temperature of 70°F DB / 61°F WB

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ClimaDry II Sequence of Operation

A heat pump equipped with ClimaDry II can operate in three modes; cooling, cooling with reheat (dehumidification), and heating. The cooling/heating modes are like any other ClimateMaster WSHP. The reversing valve (“O” signal) is energized in cooling, along with the compressor contactor(s) and blower relay. In the heating mode the reversing valve is de-energized. Almost any thermostat will activate the heat pump in heating or cooling modes. The DXM microprocessor board, which is required with the ClimaDry II option, will accept either heat pump (Y,O) thermostats or non-heat pump (Y,W) thermostats.

The reheat mode requires either a separate humidistat/dehumidistat or a thermostat that has an integrated dehumidification function for activation. The DXM board is configured to work with either a humidistat or dehumidistat input to terminal “H” (DIP switch settings for the DXM board are shown below in table 2). Upon receiving an “H” input, the DXM board will activate the cooling mode and engage reheat. Table 4 shows the relationship between thermostat input signals and unit operation.

There are four operational inputs for single stage units and six operational inputs for dual stage units:

- Fan Only
- 1st Stage Cooling
- 2nd Stage Cooling
- 1st Stage Heating
- 2nd Stage Heating
- Reheat Mode

- Fan Only: A (G) call from the thermostat to the (G) terminal of the DXM control board will bring the unit on in fan only mode.
- 1st Stage Cooling: A simultaneous call from (G), (Y1), and (O) to the (G), (Y1), (O/W2) terminals of the DXM control board will bring the unit on in 1st Stage Cooling.
- 2nd Stage Cooling: A simultaneous call from (G), (Y1), (Y2), and (O) to the (G), (Y1), (Y2), and (O/W2) terminals of the DXM control board will bring the unit on in 2nd Stage Cooling. When the call is satisfied at the thermostat the unit will continue to run in 1st

Table 2: Humidistat/Dehumidistat Logic and DXM (2.1, 2.2., 2.3) DIP settings

Sensor	2.1	2.2	2.3	Logic	Reheat (ON) - H	Reheat (OFF) - H
Humidistat	OFF	OFF	OFF	Reverse	0 VAC	24 VAC
Dehumidistat	OFF	ON	OFF	Standard	24 VAC	0 VAC

Table 3: ClimaDry II Operating Modes

Mode	Input					Output				
	O	G	Y1	Y2 ³	H	O	G	Y1	Y2 ³	Reheat
No Demand	ON/OFF	OFF	OFF	OFF	OFF	ON/OFF	OFF	OFF	OFF	OFF
Fan Only	ON/OFF	ON	OFF	OFF	OFF	ON/OFF	ON	OFF	OFF	OFF
Cooling 1st Stage	ON	ON	ON	OFF	OFF	ON	ON	ON	OFF	OFF
Cooling 2nd Stage	ON	ON	ON	ON	OFF	ON	ON	ON	ON	OFF
Cooling & Dehumidistat ¹	ON	ON	ON	ON/OFF	ON	ON	ON	ON	ON/OFF	OFF
Dehumidistat Only	ON/OFF	OFF	OFF	OFF	ON	ON	ON	ON	ON	ON
Heating 1st Stage	OFF	ON	ON	OFF	OFF	OFF	ON	ON	OFF	OFF
Heating 2nd Stage	OFF	ON	ON	ON	OFF	OFF	ON	ON	ON	OFF
Heating & Dehumidistat ²	OFF	ON	ON	ON/OFF	ON	OFF	ON	ON	ON/OFF	OFF

¹Cooling input takes priority over dehumidify input.

²DXM is programmed to ignore the H demand when the unit is in heating mode.

³N/A for single stage units; Full load operation for dual capacity units.

⁴ON/OFF = Either ON or OFF.



Stage Cooling until the 1st Stage Cooling call is removed or satisfied, shutting down the unit. NOTE: Not all units have two-stage cooling functionality (e.g. TLV084-150 units).

- 1st Stage Heating: A simultaneous call from (G) and (Y1) to the (G) and (Y1) terminals of the DXM control board will bring the unit on in 1st Stage Heating.
- 2nd Stage Heating: A simultaneous call from (G), (Y1), and (Y2) to the (G), (Y1), and (Y2) terminals of the DXM control board will bring the unit on in 2nd Stage Heating. When the call is satisfied at the thermostat the unit will continue to run in 1st Stage Heating until the call is removed or satisfied, shutting down the unit. NOTE: Not all units have two-stage heating functionality (e.g. TLV084-150 units).
- Reheat Mode: A call from the Humidistat/Dehumidistat to the (H) terminal of the DXM control board will bring the unit on in Reheat Mode if there is no call for cooling at the thermostat. When the Humidistat/Dehumidification call is removed or satisfied the unit will shut down. NOTE: Cooling always overrides Reheat Mode. In the Cooling mode, the unit cools and dehumidifies. If the cooling thermostat is satisfied but there is still a call for dehumidification, the unit will continue to operate in Reheat Mode.

ClimaDry II Component Functions

The ClimaDry II option consists of the following components:

- Motorized Valve/Proportional Controller
- Supply Air Sensor
- Loop Pump
- Hydronic Coil
- Expansion Tanks
- Low Pressure Switch

The Proportional Controller operates on 24 VAC power supply and automatically adjusts the water valve based upon the Supply Air Sensor. The Supply Air Sensor senses supply air temperature at the blower inlet providing the input signal necessary for the proportional control to drive the motorized valve during the reheat mode of operation. The Motorized Valve is a proportional actuator/three-way valve combination used to divert the condenser water from the coax to the hydronic reheat coil during the reheat mode of operation. The proportional controller signals the motorized valve based on the supply air temperature of the supply air sensor.

The Loop Pump circulates condenser water through the hydronic reheat coil during the reheat mode of operation.

In this application, the loop pump is only energized during the reheat mode of operation. The Hydronic Coil is utilized during the reheat mode of operation to reheat the air to the setpoint of the proportional controller. Condenser water is diverted by the motorized valve and pumped through the hydronic coil by the loop pump in proportion to the control setpoint. The amount of reheating is dependent on the setpoint and how far from setpoint the supply air temperature is. The factory setpoint is 72°F [22°C], generally considered “neutral” air.

ClimaDry II Application Considerations

The reheat coil adds a small amount of resistance to the air stream. In some cases the high static option may be required for applications with higher static ductwork. Consult the submittal data or the Installation/Operation/Maintenance (I.O.M.) manual for the specific heat pump to review blower tables.

Unlike most hot gas reheat options, the ClimaDry II option will operate over a wide range of EWTs. Special flow regulation (water regulating valve) is not required for low EWT conditions.

Water-Source Heat Pumps with ClimaDry II should not be used as make-up air units. These applications should use equipment specifically designed for make-up air.



Date:	Item:	Action:
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Obsolete